

New ADEQ Rules Advance Water Recycling

by

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Phoenix, Arizona
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Arizona in the national reuse context

Arizona reuse—past and present

Current rule revision

- Recycled water umbrella
- Gray water
- DPR
- Next steps



Reclaimed Water Milestones

1972 – First reclaimed water rules, ADHS

2001 – Comprehensive rules transform program



**Reclaimed water pipeline,
City of Chandler**



**Viticulture with reclaimed water, Cottonwood
(Yavapai College photo)**

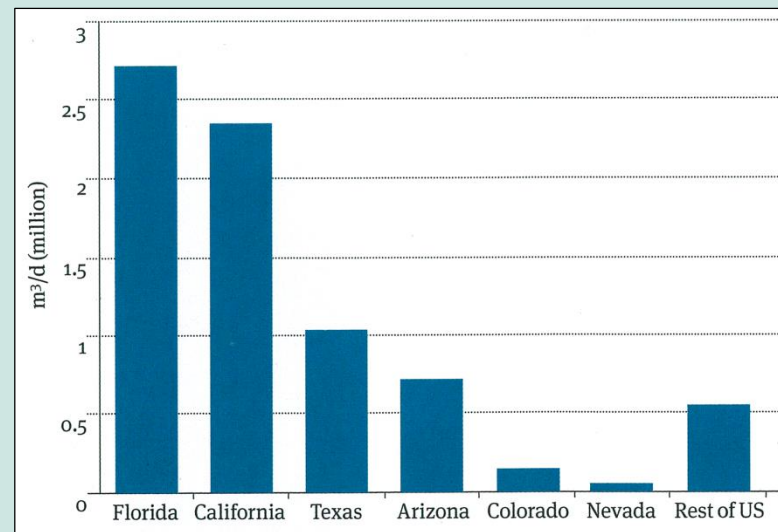
Rules Helped Spur Reuse, National Prominence

82% of reuse occurs in just four states, Arizona being one



Map: Western Water, July/August 2008

Reused Wastewater Flows, 2014

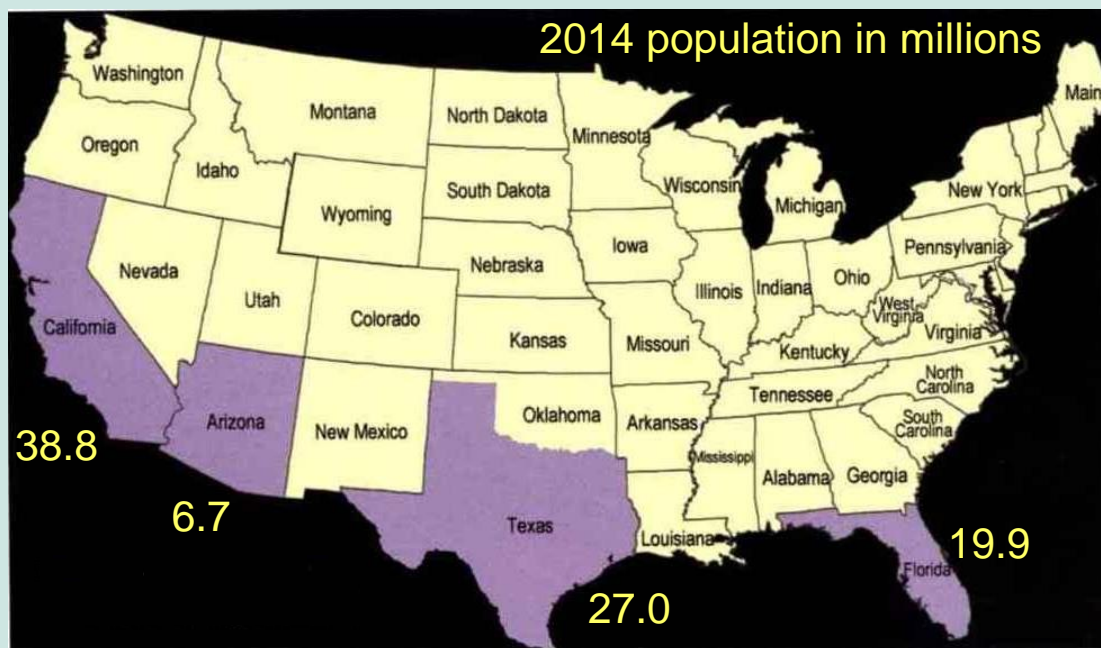


Source: Bluefield Research

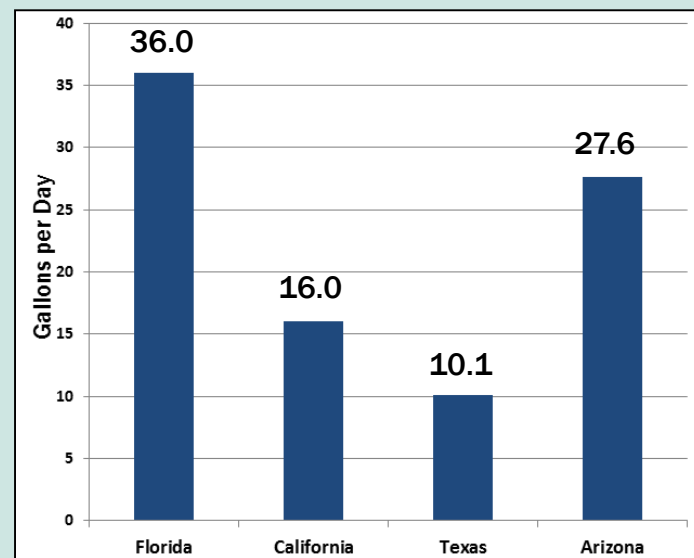


Rules Helped Spur Reuse, National Prominence

Arizona is 2nd highest nationally in per capita reuse



Reuse Per Person, 2014



Rules Helped Spur Reuse, National Prominence

Water Reuse Capacity (AF/yr)		Reclaimed Water as % of Total Water Supply
Israel	510,000	20%
Singapore	80,783	30%
United States	3,400,000	3%
Florida	955,000	4%
California	807,000	2%
Texas	482,000	3%
Arizona	504,000	7%

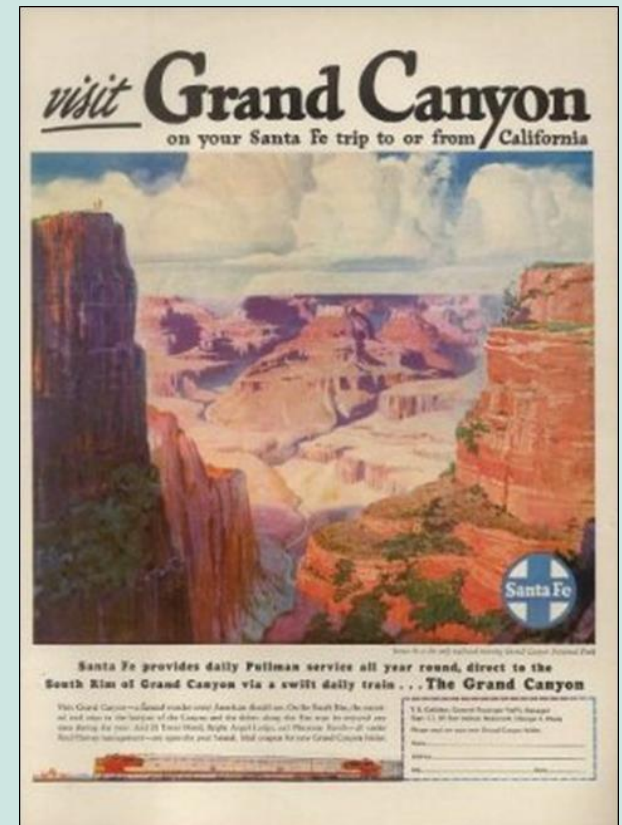
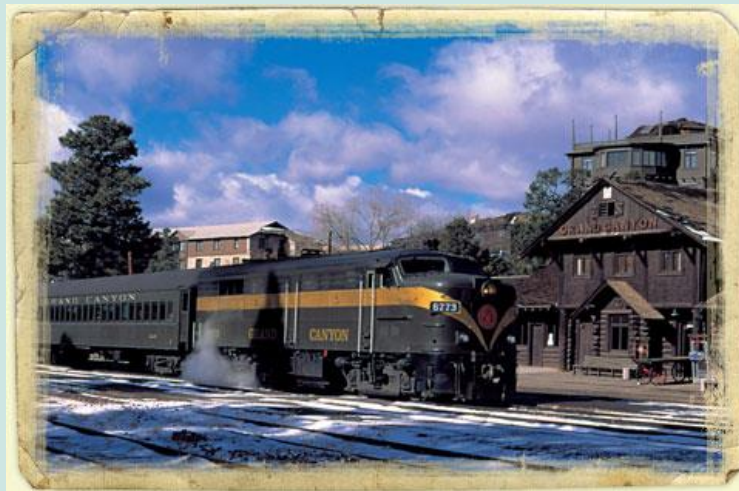
Source:
Bluefield Research



...but **#1** at integrating reuse into the water supply portfolio

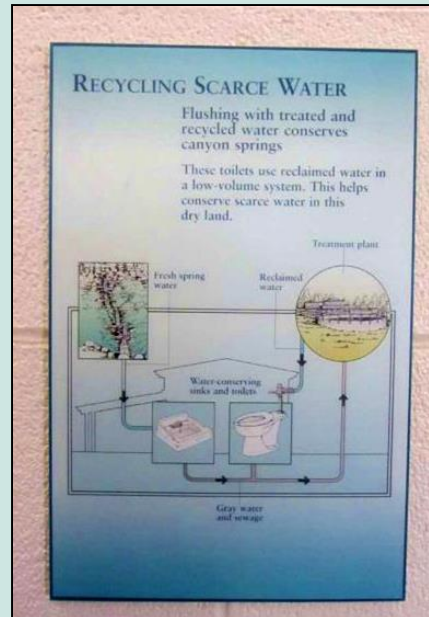
1926 – First WWTP in US built specifically to allow reuse (0.13 mgd capacity)

- Toilet flushing
- Boiler feed for power generation
- Water for steam locomotives



Still water-short today,
still using reclaimed water!

- Toilet flushing
- Landscape irrigation



**Restroom at Visitor Center,
Grand Canyon National Park, 2013**

1932 – irrigated agriculture receives reclaimed water from new Phoenix 23rd Avenue WWTP



- Phoenix WWTPs supply reclaimed water for irrigated agriculture to this day

Sewage Farming: A Trip Back in Time

Irrigation with raw sewage

- Popular in arid west due to limited water supplies
- Reached peak in CA in 1923
 - over 70 cities had sewage farms for growing **food crops**
- AZ sewage farms in 1937
 - Phoenix
 - Tucson
 - Casa Grande
 - Nogales

Phoenix Sewage Farm
(USGS, 1899)

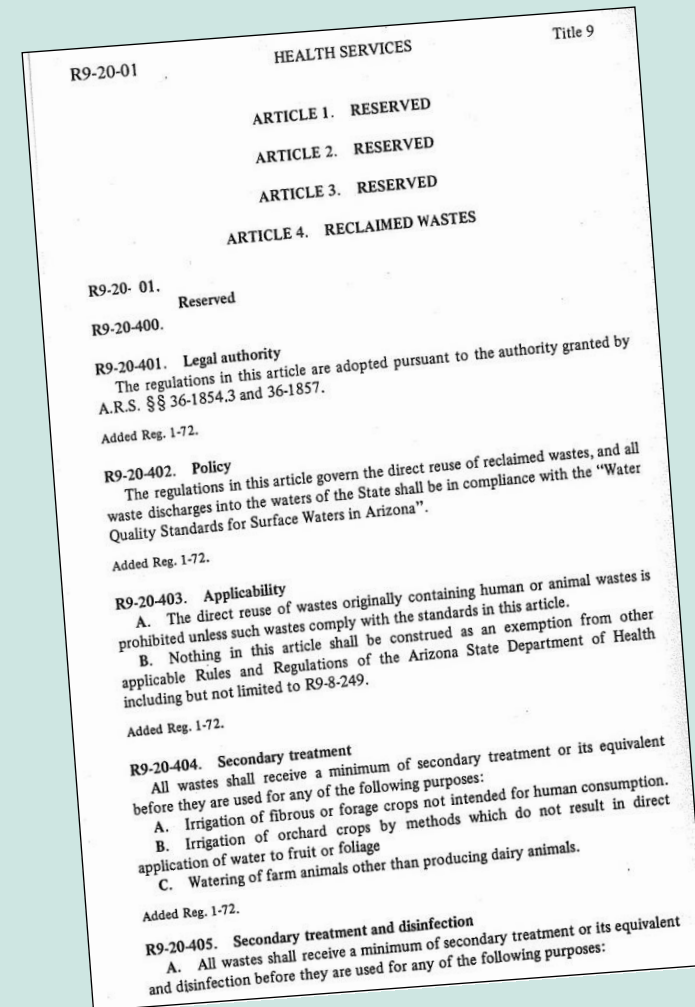


4. SEWAGE IRRIGATION AT PHOENIX, ARIZONA.

- **Jan 1972** – **1st reclaimed water rules**



1974—Reclaimed water reuse begins at Fountain Hills



Reclaimed Water for Power Generation

1983 – Arizona's largest WWTP in Phoenix
begins delivery to Palo Verde NGS

- Largest nuclear power plant in US
- Unique in world: 100%-cooled by reclaimed water



**Palo Verde Nuclear
Generating Station**
Photo: AMWUA

Reclaimed Water for Power Generation

Palo Verde Nuclear Generating Station

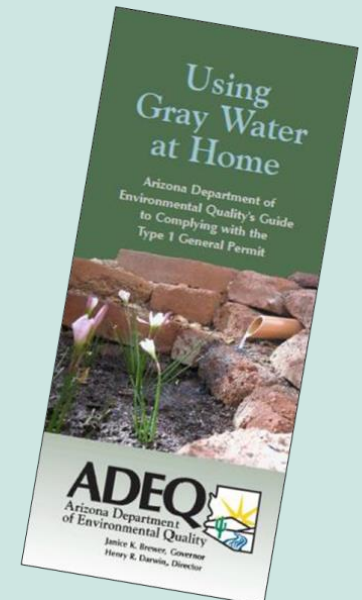
- Receives 60 mgd
 - 45% of WWTP flow
- 36 mi. long pipeline
 - Up to 9½' in diameter
- 3% of entire US reuse!



**Lined impoundment for cooling tower brine,
Palo Verde Nuclear Generating Station**

2001—Comprehensive Rules Transform Program

- Stringent treatment standards for new/expanded WWTPs under APP
- Permit program for reclaimed water end users
- RWQS for five classes of reclaimed water (A+, A, B+, B, C)
- List of end uses allowed for the five classes
- Home gray water use allowed without a “hard” permit



Key 2001 Change—New WWTP Standards

New and expanding WWTPs must employ Best Available Demonstrated Control Technology (BADCT)

- Pathogen-free effluent
 - No *E. coli*, 4 of 7 daily samples
 - Never over 15 cfu/100 ml
- Nitrogen removal, ≤ 10 mg/l
- Odor control



Photo: Dartmouth Univ.

Stringent treatment standards → clean water for reuse

Some Class A+ and A Allowed Uses

- irrigation of food crops
- recreational impoundments
- residential/schoolyard irrigation
- toilet & urinal flushing
- fire protection systems
- snowmaking
- and more



Arizona Snowbowl



**Reclaimed Water
Fire Hydrant**



**Landscape impoundment,
Freestone Park,
Gilbert, AZ**

In Arizona, Reuse is Ubiquitous!

ADEQ's 98 largest permitted WWTPs (> 1 mgd)

- 93% distribute reclaimed water for reuse/recharge
- 56% distribute Class A+ water

100% reuse



**EPCOR Wishing Well WWTP,
Ft Mohave, 1 mgd,
Valentine Engineering photo**

100% reuse and recharge



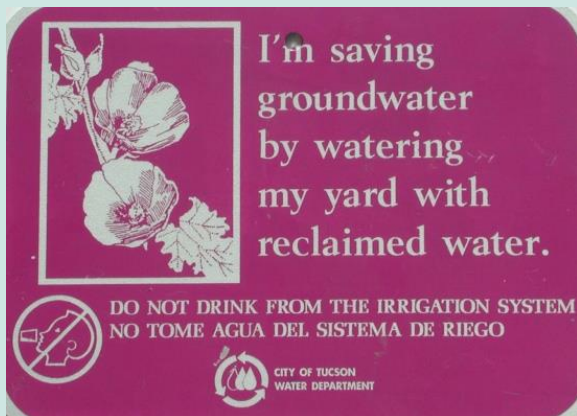
**City of Scottsdale
Water Campus, 20 mgd
Credit: Aerotech Mapping**

Arizona's Largest Reclaimed Water System

City of Tucson

- Serves 1000s of residential, M & I, and agricultural users
 - 160 miles of **purple pipe**
 - 18 golf courses
 - 50 parks
 - 65 schools (incl. Univ. of Arizona)
 - >700 single family homes

**Irrigating athletic field
with reclaimed water,
University of Arizona**



- **City of Flagstaff**

13 schools (incl. NAU)

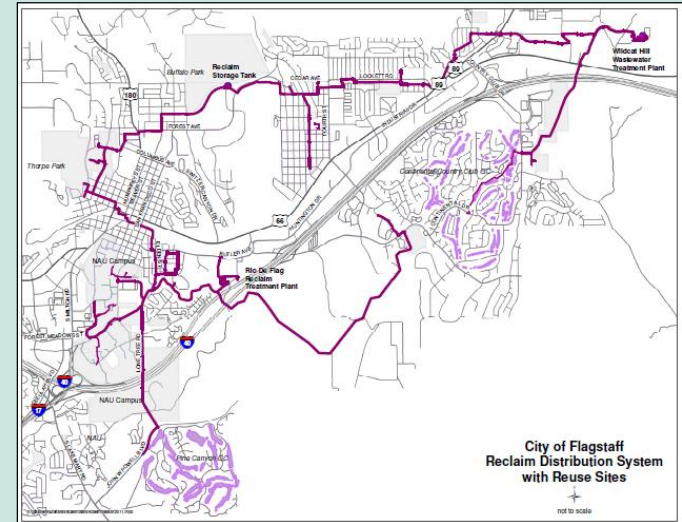
18 parks & other landscaped sites

4 golf courses

2 cemeteries

1 ski area

1 industry: SCA Tissues

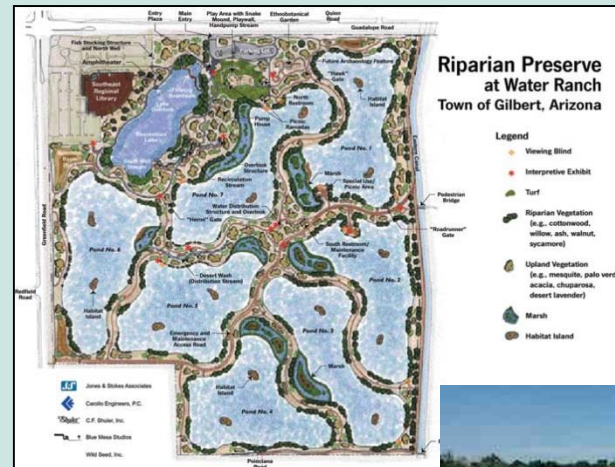


56 reclaimed water recharge facilities permitted by ADWR

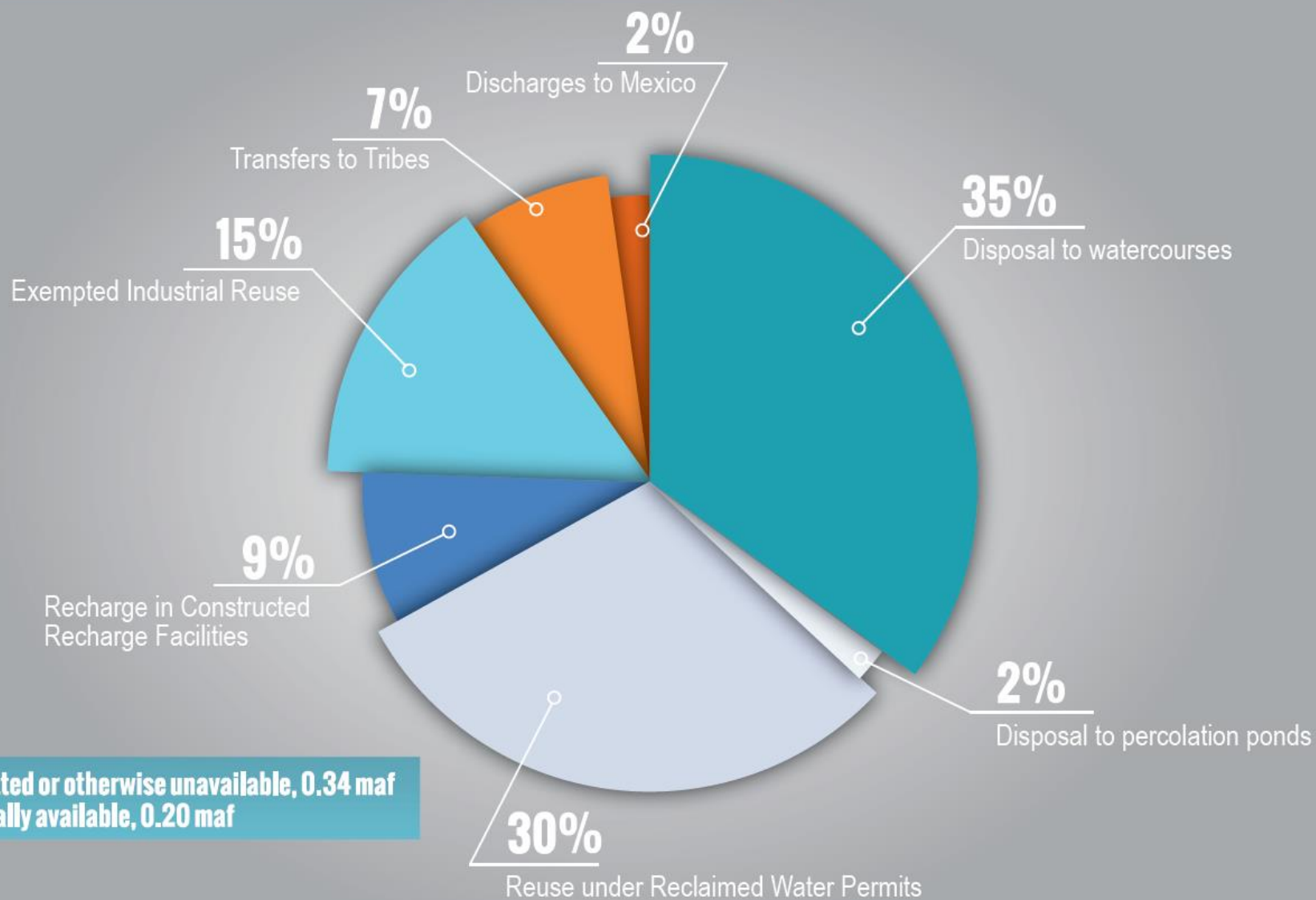
- Permitted capacity is 16% of permitted WWTP capacity
- 8.8% of total WWTP flows were recharged in 2014



**SWEETWATER
WETLANDS**



Disposition of Treated Wastewater



Notes:

1. Percentages are tentative. Do not cite.
2. Chart does not include septic tanks, which serve 20% of Arizona's population.

Percentages are provisional.

Discharges to Mexico



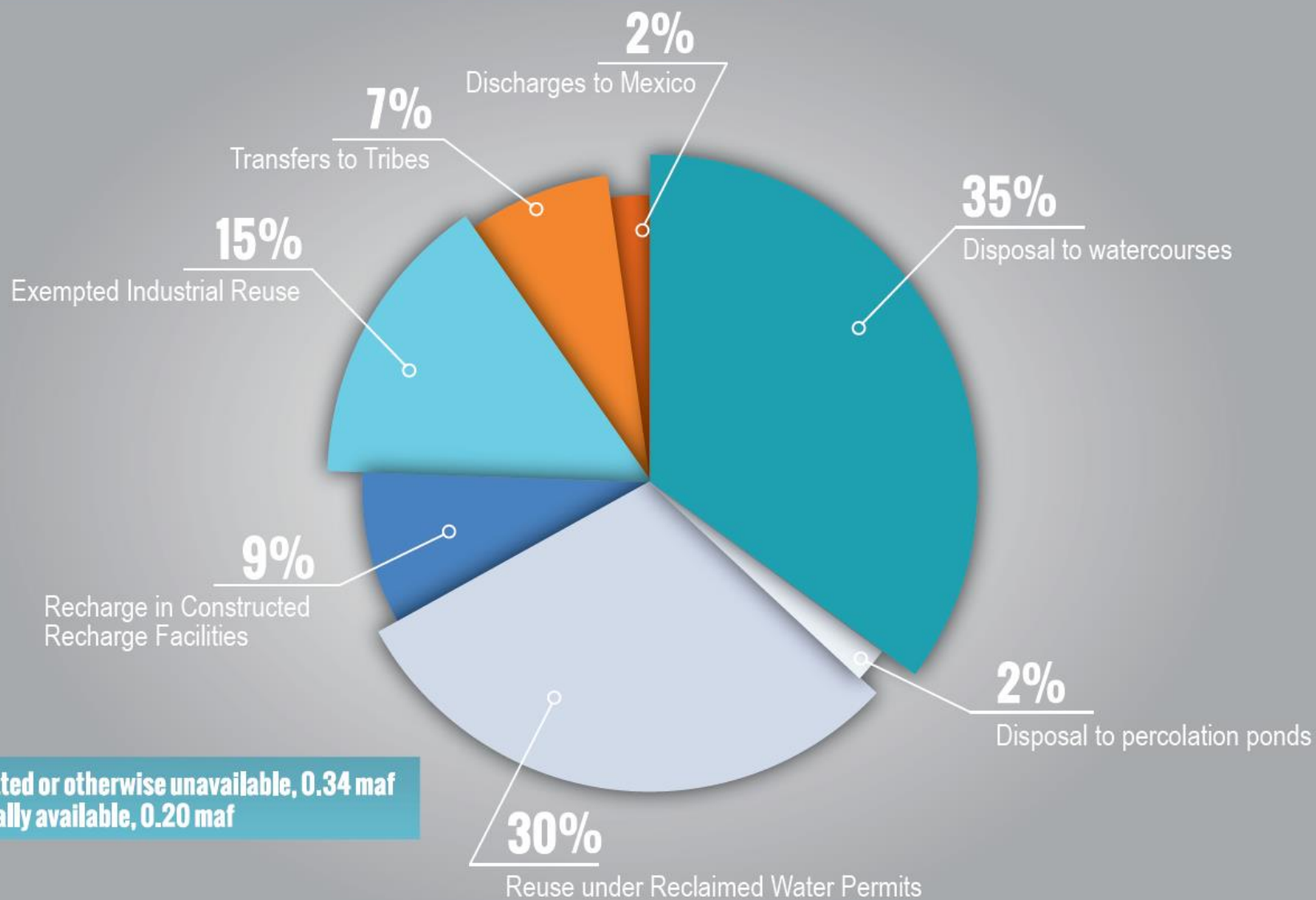
**Yuma WWTP, AZ,
discharges to Colorado R.**

**Diverted by Morelos Dam
for irrigation in Mexico**



**Douglas WWTP, AZ, outfall under
border fence into Mexico for
irrigation reuse**

Disposition of Treated Wastewater



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Unintended Consequences?

Is reclaimed water becoming so valuable that riparian areas dependent on it are becoming threatened?



**Santa Cruz River below
Nogales International WWTP,
an “effluent dependent” stream**

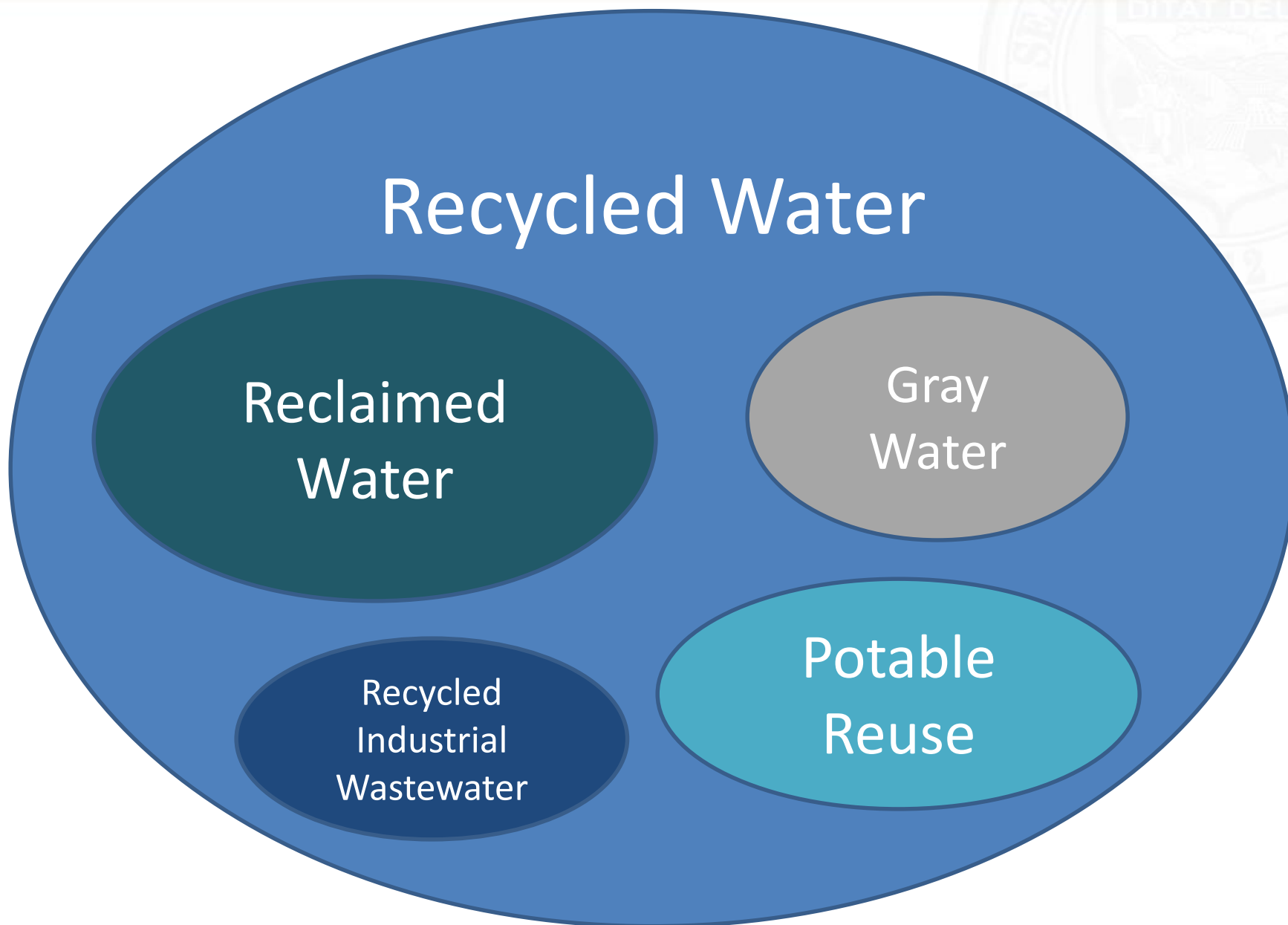
Photo: Channing Turner, Cronkite News

Why The Current Rule Revision?

- Keep up with the rapidly advancing reclaimed/reuse field
- Even more need for sustainable water supplies
- Need to review 2001 reclaimed water quality standards
- Need to address potable reuse



**Advanced treatment of reclaimed water,
Scottsdale Water Campus**
City of Scottsdale photo



New Recycled Water Umbrella



Article 7	Use of Recycled Water
Part A	General Provisions
Part B	Reclaimed Water
Part C	Recycled Industrial Wastewater
Part D	Gray Water
Part E	Purified Water for Potable Use



“Recycled Water” means...

“a processed water that originated as a waste or discarded water, including reclaimed water and gray water, for which the Department has designated water quality specifications to allow the water to be used as a supply.”



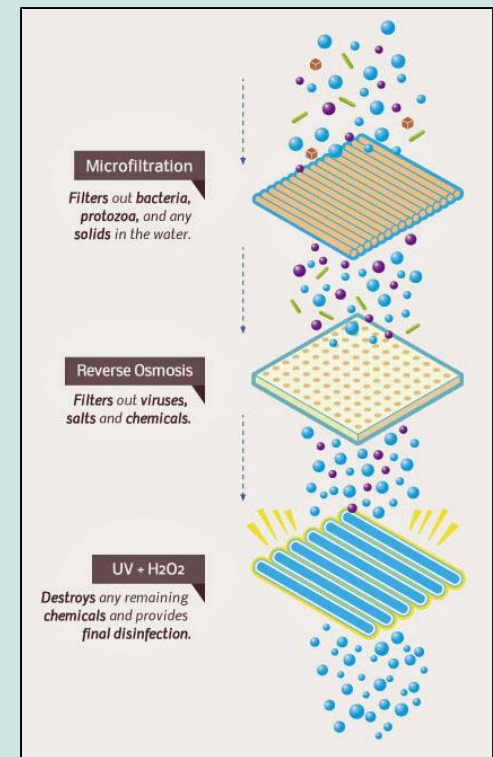
1. New “recycled water” nomenclature
2. Umbrella for adding other recycled waters in future
2. Improved administrative requirements for permits
3. Better larger-scale gray water permit
4. ***New permit and interim criteria for direct potable reuse***



Creates *Recycled Water Permit for Purified Water for Potable Use*

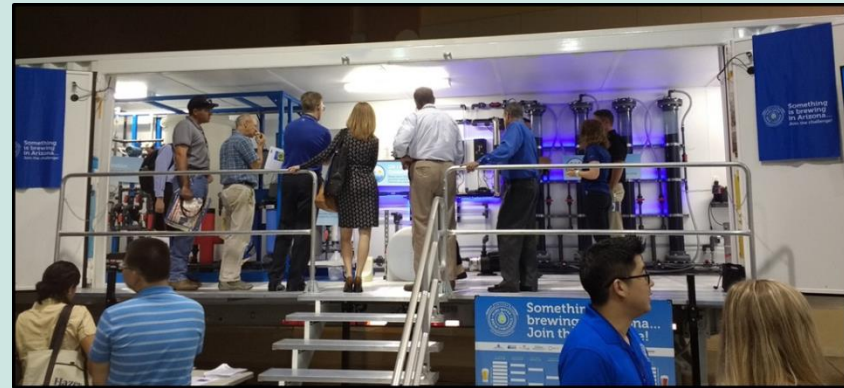
- Permit is for an ***Advanced Reclaimed Water Treatment Facility***

“a facility that treats and purifies Class A+ or Class B+ reclaimed water to produce potable water suitable for distribution for human consumption.”



DPR Under the New Rule

- **Produced water from an ARWTF**
 - no longer reclaimed water
 - considered a surface water for purposes of SDWA
 - all SDWA requirements apply
 - rule is consistent with earlier Substantive Policy published by ADEQ that allowed permitting of Brew Challenge Trailer



Design Report for an ARWTF Must Address:

- **Source water characterization**
- **Pilot treatment system**
- **Microbial control technology**
- **Microbial logarithmic reduction targets**
- **Chemical control technology**
- **Monitoring plan**
- **Start-up plan**
- **Operation and maintenance plan**
- **Operator Training**
- **Technical, financial, and management capability**

Toast 2018 New Year's Eve with a 'toilet to tap' brew!



And the winner is...
Dragoon Brewing Company

Clear Water Pilsner



What Next? *More Rulemaking*

- Expert work groups formed in April, 2017, to provide recommendations to ADEQ
 - *Reclaimed WQ standards*, Dr. Channah Rock, Chair
 - review standards based on current science
 - *Infrastructure/technology*, Tim Thomure, Chair
 - detailed criteria for potable reuse

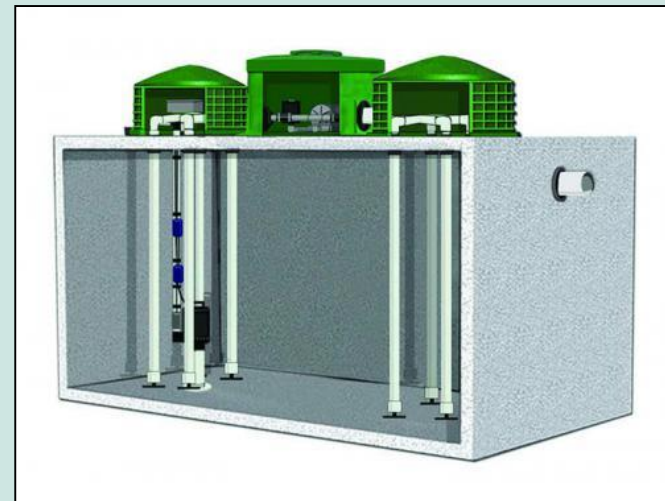
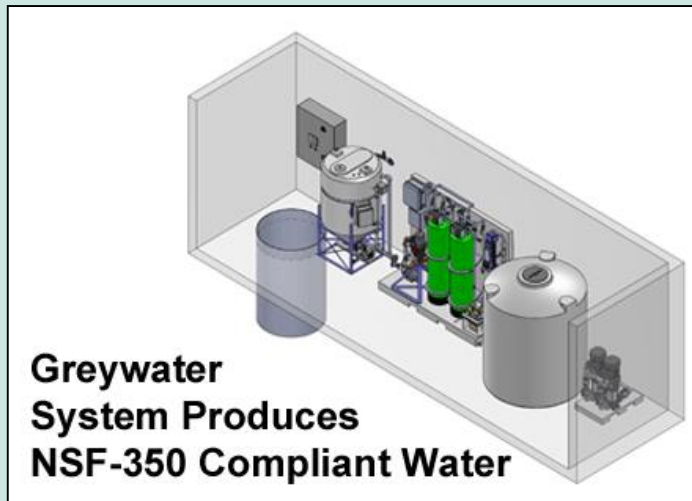


Wheeling reclaimed
water around,
Gilbert Riparian Preserve

Town of Payson
Green Valley Lake



- Convene work group to determine feasibility of allowing reuse from on-site wastewater treatment systems



**Aerobic On-site Wastewater
Treatment System**

Stay tuned for next steps

Find us at: www.azdeq.gov

or e-mail me at:
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